Table 1: Summary of the total expanded uncertainties (k=2) associated with the determination of dwell positions for the Nucletron interstitial ring applicators used in this study. The uncertainties were obtained by combining in quadrature uncertainties associated with pixel resolution (σ_{res}), correcting for rotation of digitized films (σ_{rot}), identification of centre of the rings (σ_{ring}) and determination of coordinates of the irradiated dwell positions ($\sigma_{J(x)}$, $\sigma_{J(y)}$). All measurement values are in mm.

	Dwell Position	Source[1] Set[1] x	Source[1] Set[1] y	Source[1] Set[2] x	Source[1] Set[2] y	Source[1] Set[3] x	Source[1] Set[3] y	Source[2] Set[4] x	Source[2] Set[4] y	Source[2] Set[1] x	Source[2] Set[1] y	Source[3] Set[1] x	Source[3] Set[1] y
Ø26 mm Ring	1	0.62	1.23	0.51	1.15	0.63	0.69	0.61	0.84	0.69	0.69	0.57	0.69
	5	0.51	0.73	0.47	1.42	0.54	0.63	0.46	0.91	0.56	0.56	0.55	0.47
	9	0.63	1.08	0.45	0.46	0.76	0.72	0.50	0.55	0.64	0.69	0.50	0.81
	13	0.58	0.53	0.62	0.46	0.63	0.71	0.70	0.67	0.68	0.57	0.62	0.86
	17	0.74	0.72	0.70	1.21	0.90	0.97	0.59	0.66	0.55	0.68	0.50	0.62
	21	0.56	1.14	0.48	1.01	0.66	0.71	0.50	0.71	0.51	0.71	0.46	0.43
	25	0.62	0.76	0.65	1.00	0.58	1.04	0.60	0.65	0.61	0.58	1.08	0.75
	29	0.63	0.97	0.75	1.02	0.64	0.97	0.57	0.88	0.89	0.66	0.73	0.61
Ø30 mm Ring	1	0.84	0.76	0.75	0.95	0.61	0.63			0.62	0.73	0.68	0.59
	5	0.63	0.62	0.66	1.01	0.59	1.12			0.63	1.48	0.59	0.52
	9	0.71	0.91	0.60	1.09	0.54	0.76			0.87	0.86	0.51	0.62
	13	0.72	0.84	0.68	1.30	0.61	0.55			0.57	0.80	0.67	0.71
	17	0.60	0.82	0.61	0.84	0.64	0.87			0.73	0.60	1.05	0.75
	21	0.67	0.60	0.61	1.07	0.71	0.55			0.53	0.87	0.80	0.75
	25	0.64	0.86	0.64	0.96	0.80	0.68			0.55	1.05	0.52	0.74
	29	0.68	0.82	0.66	0.72	0.74	1.09			0.67	1.47	0.52	0.67
	33	0.88	0.82	0.79	0.84	0.50	0.56			0.53	0.70	0.72	0.62
Ø34 mm Ring	1	1.12	1.36							0.59	0.99	0.71	1.08
	5	0.60	0.60							0.48	0.52	0.71	0.78
	9	0.64	0.69							0.50	0.54	0.51	0.86
	13	0.63	0.58							0.57	0.76	0.50	1.01
	17	0.54	0.81							0.65	0.89	0.62	0.87
	21	0.61	0.53							0.70	0.67	0.79	0.60
	25	0.48	0.60							0.58	0.62	0.69	0.68
	29	0.53	1.11							0.58	1.08	0.48	0.75
	33	0.54	0.80							0.55	1.46	0.54	0.70
	37	0.96	0.83							0.50	1.73	0.51	0.59

Conclusions: The source path for ring applicators is dependent on the geometry of the ring. The geometry of the ring causes the source cable to travel along a characteristic path that is different compared to the path of the source and has the effect of introducing significant deviation of the source from its expected position in the lumen along its direction of motion. The observation of significant differences between sets of Ø26 mm ring applicators has shown that, in some cases, multiple sets of the same applicator size can not be characterized by a single source path. Consequently, care must be taken to ensure that the source path of each ring is measured first.

EP-1209

Replacing cheese phantom with octavius phantom for delivery quality assurance (DQA) in Helical Tomotherapy (HT)

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Purpose/Objective: Whilst CP is used in routine clinical practice for DQA purposes prior to HT treatment, practicalities could necessitate the use of OP as a backup measure. This study investigates the validation of OP octagonal QA tool (vol 0.125cc) in contrast to the circular CP (0.057cc).
Materials and Methods: Treatment plans of 10 patients were selected and a homogenous high dose PTV area was selected for DQA. The images of Phantoms inserted with the ionisation chambers was imported from the CT scan to theTomotherapy Treatment Planning System (TPS); following which recalculation of the clinical plan was done with the above phantoms for verification purposes. Results of the DQA using the two processes were compared.
Results: The standard deviation of the measured doses of A1SL Chamber with cheese Phantom with the TPS calculated dose was 1.24 versus semiflex Chamber with Ocatavius Phantom was 0.979. For Fluence map comparison using Octavius phantom, significant adjustments were made to the beam profile measured by 729 2-d array; but after shifting the coordinates a match was achieved to the TPS calculated fluence.
Conclusions: The Deviation of the Point Dose measurements of DQA inTomotherapy with A1SL chamber Cheese Phantom) and semiflex chamber (Ocatavius Phantom) was within the accepted 1.24 and 0.979 were within tolerance limit (3%). Hence the point dose measurement of DQA plan in tomotherapy can be done with the semiflex ion chamber along with the octavius phantom. 2d array was also possible using a manual adjustment to the fluence coordinates using Octavius phantom. Octavius phantom could therefore be used for DQA of HT plans.

EP-1210

Dosimetric comparison of lateralised IMRT vs. 3D-CRT for unilateral carcinomas in the head and neck region.

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Purpose/Objective: Inverse planned intensity modulated radiotherapy (IMRT) for carcinomas of the head and neck requiring bilateral treatment can reduce toxicity through parotid sparing and is standard practice. However lateralised carcinomas of the head and neck are often treated using forward planned conformal radiotherapy due to inherent sparing of the opposite parotid. Furthermore the beam arrangement, increased number of monitor units and longer delivery times generally associated with IMRT may result in a greater dose to volume outside the PTV. This study compares the dose distributions from lateralised IMRT to forward planned, three dimensional conformal radiotherapy (3D-CRT), in patients with unilateral carcinomas in the head and neck region.
Materials and Methods: IMRT and 3D-CRT plans were created for seven patients with lateralised disease where the clinical target volume included retropharyngeal nodal levels I-V. Beam arrangements for the IMRT plans were similar to that used for 3D-CRT with beams entering only from the ipsilateral side to avoid dose bath. Plans were created for an Elekta Synergy linac at 6MV using step-and-shoot IMRT and fixed angle VMAT techniques using Monaco (v3.20.01). 3D-CRT plans created using XiO (v4.70.01). Dose-volume histograms were generated for each plan to compare doses to PTV, OARs and normal tissue. Heterogeneity and Conformity Index for PTV were also evaluated. Monitor units were compared to estimate peripheral doses in the patient for each case.
Results: Dose coverage for the 3D-CRT plans tends to be compromised in order to meet OAR constraints. The use of IMRT is seen to improve both PTV coverage and conformity whilst maintaining doses to organs at risk. Since beams were not entering through the contralateral side of the patient the usual dose bath from IMRT is avoided. In the cases where using IMRT resulted in an increase in volume of surrounding tissue receiving dose, it was the volume receiving 10% or less of the prescribed dose that was most effected and an average decrease in MU of 33% was observed for the IMRT plans.
Conclusions: The use of lateralised delivery of IMRT for unilateral head and neck cancers shows improved coverage of the PTV without compromising dose to organs at risk or resulting in an unacceptable dose bath.

EP-1211

Pitfalls in the clinical introduction of the Elekta Agility MLC

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Purpose/Objective: In September 2012, the Elekta Agility MLC was clinically introduced in our clinic. The Agility has 160 leaves of 5mm width over the full 40x40 cm field, with a very low transmission of < 0.5%. Leaves can interdigitate and move at high speed. Initially, we only had a single Agility linac and five MLCi2 linacs (with 10 mm leaves), so we aimed at maintaining exchangeability of patients between machines, without having to replan or reoptimize. In this presentation, we would like to highlight some pitfalls and practical issues encountered before and during clinical implementation.
Materials and Methods: The Agility was modelled in the Pinnacle[3] Treatment planning system (version 9.0). Even though the Agility has no backup jaws, in Pinnacle the jaws are present (even though they do not influence the dose computation). This can cause confusion, especially since the non-existent jaws can block the rendering of the actual leaf settings of the Agility. For each treatment that needed exchangeability,we first created a plan for the MCLi2. Using a Pinnacle script in combination with UNIX level programming, the beams of the plan were duplicated and converted to the Agility, creating a sum plan of both 'plans'. In this step, single MLCi2 leaves were replaced by two Agility leaves. Furthermore, since the Agility does not have backup jaws, the position of the diaphragm jaws were automatically adjusted to shield the flagpoles that were no longer blocked by the backup jaws of the MLCi2.
Results: After the conversion, we observed dose differences between original MLCi2 plan and the automatically converted Agility plan of up to 3 per cent for complex IMRT plans, which made adjustment of the number of monitor units for the Agility plans necessary. For some 3D-CRT plans, we encountered problems in the conversion when backup jaws for the MLCi2 were manually positioned beyond the leaves.
Conclusions: In clinical practice we found that it was difficult to find an algorithm to automatically convert from MLCi2 to Agility with 100% accuracy.Therefore, automatic conversion should be seen as an 'aid'. One must take extreme care and dose distributions of MLCi2 and Agility plans must be compared vigorously, both using the DVH and the 3D dose distribution. As soon as multiple Agility linacs were available in our institute, we stopped the conversion and prepared just one plan for each treatment, depending on the linac on which the treatment was performed.